An analysis of intermunicipal consortia to provide waste services based on institutional collective action

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This article analyzes the factors that affect local governments' decision-making processes on whether to engage in cooperative agreements through intermunicipal consortia. Several studies have examined this issue in Western developed countries, but there is a gap in the literature regarding the phenomenon in the developing world. The research addresses this gap and observes the Brazilian local governments' policies on waste services, focusing on cooperative agreements such as interlocal consortia. These arrangements may be a solution to the political and managerial challenges of providing public services in many areas, including waste collection, treatment, and disposal. However, it is still unclear what factors influence municipalities in their decision to cooperate. Based on cross-sectional research exploring 963 Brazilian municipalities and on the perspective of Institutional Collective Action, this study identified characteristics of communities, transaction characteristics of goods, and the structure of policy networks that influence the local governments in their decision to work cooperatively. The findings shed light on the field of public policies, particularly those carried out through intermunicipal consortia.

Keywords: institutional collective action; consortia; solid waste services; Brazilian local governments.

Uma análise dos consórcios intermunicipais para serviços de tratamento de resíduos sólidos a partir da ação coletiva institucional

Este artigo analisa os fatores que influenciam os municípios em sua tomada de decisão sobre a prestação de serviços públicos de resíduos por meio de consórcios. Vários estudos abordaram essa questão pesquisando países ocidentais e desenvolvidos, mas há uma lacuna na literatura que explora o fenômeno em países em desenvolvimento como o Brasil. Este estudo, portanto, seleciona os governos locais no Brasil e analisa sua política de coleta e tratamento de resíduos, com foco na prestação de serviços públicos por meio de acordos cooperativos, particularmente consórcios intermunicipais. Os consórcios intermunicipais podem ser uma solução para os desafios políticos e gerenciais em torno do gerenciamento de resíduos sólidos e da prestação de outros serviços públicos. No entanto, ainda não está claro quais fatores influenciam os governos locais a adotar essa estratégia. O estudo utilizou uma abordagem transversal aplicada a uma amostra de 963 municípios e adotou a perspectiva da Ação Coletiva Institucional, identificando as características da comunidade, as características transacionais dos bens, e a estrutura das redes de política pública, que influenciam a tomada de decisão dos governos locais para cooperar. Os resultados têm implicações nas políticas públicas que adotam acordos de cooperação intermunicipais no Brasil.

Palavras-chave: ação coletiva institucional; consórcios; serviços de tratamento de resíduos sólidos; municípios brasileiros.

Un análisis de los consorcios intermunicipales para servicios de tratamiento de residuos sólidos a partir de la acción colectiva institucional

Este artículo analiza los factores que influyen en los municipios en su toma de decisiones sobre la prestación de servicios públicos de residuos por medio de consorcios. Varios estudios abordaron esa cuestión investigando países occidentales y desarrollados, pero existe una laguna en la literatura que explora el fenómeno en países en desarrollo como Brasil. Por lo tanto, este estudio selecciona los gobiernos locales de Brasil y analiza su política de recolección y tratamiento de residuos, con foco en la prestación de servicios públicos a través de acuerdos cooperativos, particularmente, consorcios intermunicipales. Estos pueden ser una solución para los desafíos políticos y gerenciales relacionados con la gestión de residuos sólidos y la prestación de otros servicios públicos. No obstante, aún no está claro qué factores influyen en los gobiernos locales para adoptar esa estrategia. El estudio utilizó un enfoque transversal aplicado a una muestra de 963 municipios y adoptó la perspectiva de la acción colectiva institucional, identificando las características de la comunidad, las características transaccionales de los bienes, y la estructura de las redes de políticas públicas, que influyen en la toma de decisiones de los gobiernos locales para cooperar. Los resultados tienen implicaciones en las políticas públicas que adoptan acuerdos de cooperación intermunicipales en Brasil.

Palabras clave: acción colectiva institucional; consorcios; servicios de tratamiento de residuos solidos; municipios brasileños.

1. INTRODUCTION

The adoption of alternative arrangements to provide public services has been discussed as a strategy to overcome criticisms of traditional public administration and the participation of the private sector in public services delivery (Bel & Warner, 2015). Traditional public administration is based on the rule of law, i.e., on the strict compliance of existing operational protocols – even though such protocols do not guarantee efficiency or the best use of taxpayers' money (Osborne, 2006). According to Hood (1991), political influence within the daily routine of public institutions is a major cause of inefficiency, which may lead to the assumption that private sector participation in public service delivery is a solution to reduce political interference. The private sector, therefore, would bring its typical characteristics such as competition and business-orientation to improve services at lower costs. However, despite political and managerial expectations, studies on private sector participation in public service delivery have not shown gains in efficiency (Bel, Hebdon, & Warner, 2018). For Osborne (2010), the participation of the private sector can be considered an intermediate stage between the traditional public administration and the new public governance approaches toward public service delivery.

The new public governance discusses alternative arrangements for public services delivery, privileging cooperation between public sector organizations through networks (Evans & Sapeha, 2015). Although networks are not a novelty in public administration, they have been recognized as a practical tool in administrative reforms and for the development of the public sector (Silvestre, Marques, Dollery, & Correia, 2019a, 2019b). In this context, consortia have emerged as a prominent form of cooperation, promoting collaboration among public sector organizations to jointly provide public services (Meza, Grin, Fernandes, & Abrúcio, 2019). The aim of these arrangements, in this case, is to effectively and efficiently offer public services in a way that would not be possible if each entity had to offer the same service individually (Klok, Denters, Boogers, & Sanders, 2018). As a result, cooperation is especially attractive for local governments to promote social and economic development (Andrew & Feiock, 2010).

According to Garson (2009), Santos, Fernandes, and Teixeira (2013), Nascimento and Fernandes (2015), local governments in Brazil have worked through consortia to provide services in areas such as social services, healthcare, culture, and housing. However, in areas such as solid waste services and the impact of this activity on the population's health and welfare, there are still managerial challenges for municipalities, considering that the complexity of this service is related to the size of the population. Additionally, the Brazilian *Política Nacional de Resíduos Sólidos* (PNRS) (national solid waste policy), established by Law 2289 in 2015, provides on cooperative agreements among local governments in order to achieve the policy goals. However, the decision to enter into these agreements requires overcoming social, fiscal, and political barriers. Therefore, the research question is

> *What factors influence the Brazilian local governments' decision to cooperate in providing solid waste services through consortia?*

This study analyzes the factors influencing the Brazilian local governments' decision-making process of whether to engage in intermunicipal consortia to provide solid waste services. The research adopts a cross-sectional approach and uses official statistics for the year 2015. Also, this study is probably the first attempt to use the lens of Institutional Collective Action to expand the understanding of this issue in Brazil. Building on Feiock's (2007, 2009, 2013, 2016) conclusions, the results obtained in this research are discussed based on the perspective of the rational choice. The decision to adopt the rational choice to analyze the results considers the fact that most studies on solid waste services focus on the costs of the service (Bel & Warner, 2015), and address the phenomenon in Western developed countries. These characteristics expose the lack of attention to potential differences in the local governments' motivation to engage in cooperative arrangements to provide public services. In addition, Di Porto and Paty (2018) point out that there are few theoretical and empirical studies analyzing the determinants of public cooperation at the local level. This study, therefore, contributes to filling the gap in the literature by researching a developing country that has extensive experience with public cooperative agreements through consortia, and by offering a review on a subject that is still dispersed, complex, and incoherent (Voorn, Van Genugten, & Van Thiel, 2019).

The next section introduces the Institutional Collective Action approach, and the intermunicipal consortia created to provide solid waste services in Brazil. The third section presents the empirical strategy adopted, followed by the discussion of results and the conclusion.

2. AN INSTITUTIONAL COLLECTIVE ACTION ANALYSIS OF INTERMUNICIPAL CONSORTIA IN BRAZIL

Cooperation among public entities involves more than costs and efficiency, focusing on governance (Bel & Warner, 2015). Tabi and Verdon (2014) classify the cooperative arrangements as contemporary collective actions due to the existence of multiple actors and political problems that are not local and affect more than one neighbor municipality. It is crucial, therefore, to understand the determinants of cooperation among local governments, since the primary concern of the Institutional Collective Action is the motivation of the actors (Baldwin, Chen, & Cole, 2018).

2.1. Institutional Collective Action

Studies on collective action started with the seminal work by Gordon (1954), Olson (1965, 1969), and Hardin (1968). These studies aim to understand behavioral dilemmas related to collective action, emphasizing issues of governance of shared resources (Capelari, 2017). More recently, Oström (2005, 2011) proposed the institutional analysis development framework (IAD) to collective action, arguing that self-initiative and interaction among actors can lead to a fruitful cooperation. However, clear rules must be put in place to guide the decision-making processes. Also, the arena where collective action takes place must be better understood. It is the space where negotiations to solve disputes occur, and the locus where the action materializes will influence the implementation of public policies and their effects (Nascimento, 2012).

When considering the IAD, Feiock (2004, 2007) suggests a second-generation rational choice explanation for voluntary regional governance. The Institutional Collective Action (ICA) approach seeks to identify contextual factors that affect the decision to provide public services through cooperative arrangements. According to the approach, local governments supported by their networks may benefit from voluntary joint efforts that facilitate fulfilling social demands. It is a mechanism that allows the creation of cooperative agreements among stakeholders, i.e., public entities (such as local governments) and non-public actors (such as private organizations and communities). Cooperating parties – facing similar social and fiscal problems – can reduce transaction costs through better negotiation, monitoring, and control of contracts (less costly when involving more than one public entity in the partnership) (Feiock, 2004, 2013; Tavares & Feiock, 2017). For Feiock (2007), the scope of transaction costs' problems and the ability of local leaders to tackle them, depends on "the transaction characteristics of goods, the geographic, social, and demographic position of communities, the structure of local government political institutions, and the structure of policy networks" (p. 53), which are also key-elements for successful regional governance.

As for the aspect '*characteristics of communities,*' which refers to the social, economic, and political environments, Feiock (2007) concludes that it is easier for local governments to engage in cooperative agreements when potential partners are in similar environments, tackling the same problems. Homogeneity potentially leads to mutual interests and the same preferences regarding public services, facilitating cooperation. Therefore, it is difficult for demographic and social equivalence and homogeneity to lead to differences in economic and political forces.

Bel and Warner (2016) identify the size of the population as the most common variable in the analysis of cooperation based on the characteristics of communities. Klok et al. (2018) state that the size of the population – measured by the number of residents – influences homogeneity among local governments in cooperation. This happens because smaller local governments do not have equivalent financial and human resources when compared to larger local governments, and adapt to access the benefits of the cooperative arrangement. In other words, smaller municipalities are more likely to cooperate to achieve optimal economic scales. On the other hand, the local governments with financial and human resources tend to be less likely to participate in cooperative agreements. Hefetz and Warner (2011) introduce other characteristics of local government as the main drivers of decision-making in this field.

Along with the number of residents, the authors argue that local governments in less central regions and rural areas are more likely to cooperate as an alternative to reduce the cost of services, replacing possible contracts with private sector organizations (costlier regarding management and control). Municipalities in rural areas tend to cooperate seeking access to financial resources that could not be reached when considering the social and demographic characteristics of only one local government (Agranoff & McGuire, 1998). Finally, Bel, Fageda, and Mur (2012) conclude that larger local governments and those that are geographically furthest away do not cooperate as often as others, which can be explained by fiscal stress.

According to Warner and Hefetz (2002) and Hefetz and Warner (2011), the existing financial resources depend on fiscal stress, which can be a determining factor for cooperation, since it depends on the characteristics of the local government (Bel et al., 2012). For Blaeschke and Haug (2018), the size of the population affects the organizational costs related to public services. For example, organizational costs are higher when the provision of public services requires more employees. If service revenues cannot cover existing organizational and operational costs, local governments will undoubtedly face financial shortages, that is, fiscal stress compromises the provision of services and the citizens' welfare.

Lawmaking is crucial for cooperation, and political institutions define the conditions for creating cooperation agreements. Laws are not only essential for the implementation of cooperative arrangements, but they are also crucial for defining the paths to be followed and how cooperation is legally constituted (Klok et al., 2018). In the case of Brazil, the format of political institutions is the same in all municipalities, hence the assumption that political institutions hardly affect decision-making processes on whether to engage in interlocal consortia.

Another element identified is the structure of policy networks, which includes the number of cooperation agreements in which the local government is participating and the size of its network structure. For Feiock (2007), the contractual relationship defined by two parties for the provision of public services is considered "dyadic," and the inclusion of more than two parties characterizes a network. On the other hand, Olson's (1965) arguments when discussing the production of public goods and group theory can be observed to address the issue of network structure. For the author, the inclusion of more parties in a cooperative relationship may represent a risk to the potential gains of these arrangements, since the proximity of being in smaller groups is lost.

Klok et al. (2018) argue that the number of existing agreements among the actors is essential to overcome structural failures of the network because this factor can influence the decision to participate in this type of structure. Also, previous experiences facilitate the engagement in new cooperative agreements designed to provide services due to existing trust among the actors (Chen & Lee, 2017). On this matter, Feiock (2007) already pointed to trust as a central variable of cooperation. It arises from reciprocity, creating social capital that leads to cost reduction. Thus, a local government that is already familiar with participating in cooperative arrangements is likely to be involved in this type of initiative (Di Porto & Paty, 2018). In this case, experienced participants have already dealt with issues that may be of concern for the leadership and affect the management of cooperative processes, which reduces barriers preventing them from entering in new cooperative agreements (Chen & Lee, 2017).

Issues of leadership and management have a political nature, potentially affecting cooperative relationships (Stoker, 2006). According to Voorn et al. (2019), informal coordination can be a solution for building trust, and this type of coordination depends on electoral cycles, considering that ideologically aligned local governments tend to cooperate more often. For Stoker (2006, p. 46), "politics is the process that breathes life into the whole process," and is central to reducing transaction costs (Warner & Hefetz, 2012). For this reason, local governments are more likely to cooperate when government officials represent ideologically aligned political parties (Bel et al., 2012).

Finally, the concept 'transaction characteristics of goods' affects cooperation agreements. According to Olson (1969), the existing problems immediately represent a burden for the actors. Fageda and Mur (2012) found evidence that local governments are more likely to cooperate when faced with high-cost services, seeking to deliver such services even when resources are scarce.

This section described the ICA to explain voluntary regional governance (Feiock, 2004, 2007). As shown, characteristics of communities, political institutions, transaction characteristics of goods, and the structure of policy networks can influence municipalities in the decision-making processes of whether to engage in consortia. The ICA was developed in studies that examined Western developed countries. However, other experiences need to be observed to help to understand whether such theoretical developments can contribute to explaining the phenomenon in countries with other characteristics. This research was carried out against this backdrop, focusing on a developing country (Brazil), particularly analyzing its municipalities.

2.2. Cooperation in Brazilian Local Governments: Overview

The Brazilian federal government created metropolitan regions in 1973/74. In 1988, more than a decade later, the Constitution defined a clear political distinction between the federal, state, and municipal governments. The recognition of metropolitan regions became the responsibility of the state government, which received these political prerogatives in 1995. Since then and until the end of 2017, 77 metropolitan areas have been established in Brazil, formed based on conurbations linking nearby cities. In addition, they are characterized by a high concentration of residents and economic activities, which overlap with the jurisdiction of the local governments (Garson, 2009). Metropolitan regions are urban agglomerations (Fernandes & Araújo, 2015), where the population carries out daily activities that socially and economically affect the metropolises (Balbim et al., 2011). Fernandes and Araújo (2015) clarify that metropolitan regions and metropolises are different concepts, and many areas were incorrectly classified as metropolitan regions due to confusion between these two definitions.

The establishment of metropolitan regions sought to promote cooperation among municipalities in urban areas, in a decentralization movement that emerged with the 1988 Brazilian Constitution and that brought challenges to the provision of local services. Metropolitan regions were identified as a possible solution to encourage public cooperation. However, the procedures to transfer funds from the federal government to these local arrangements were not defined by the Brazilian Statute of the Metropolis that guide the operation of these areas. Thus, it is not yet clear what are the main reasons behind the increasing number of metropolitan regions in Brazil, and state governments have not shown a preference for the development of these regions. State

governments lack legitimacy for adopting coercive mechanisms on this matter (such as passing laws) (Garson, 2009), and, in the absence of a regulatory framework, metropolitan region councils cannot govern the participation of municipalities (Fernandes & Araújo, 2015). This is potentially problematic since there are different local preferences and political practices (Castro, 2006), and it is possible to argue that there is no regional culture (Kornin & Moura, 2004). In addition, the different characteristics of the entities involved in the cooperation challenge the financing of such activities. Garson (2009) details that the capitals are favored by federal and state services – for example, hosting healthcare facilities –, which are justified considering a large number of residents in those areas. Also, the differences between capitals and other municipalities can be explained by the significant disparity in revenues since capitals are better positioned to collect enough taxes to finance their activities.

In short, metropolitan regions have become a first attempt to develop the provision of integrated local services. However, without a regulatory framework and financial support, metropolitan regions have used cooperative agreements such as intermunicipal consortia to carry out public services on a regional scale.

2.3. Brazilian intermunicipal consortia as an alternative to providing solid waste services

Article 23 of the 1988 Brazilian Constitution provides on consortia as a possible arrangement to encourage cooperation between the units of the federation. Consortia started to be accepted in the Brazilian legal system in 2005, with the enactment of Law 11107, known as the Public Consortium Law. In the national legal framework, this type of cooperation is conceptualized as the voluntary partnership between two or more units of the federation, to execute tasks, implementing a program, and overcoming restrictions in a specific sector (Bittencourt, 2011).

One of the particular features of consortia is the willingness of public units to voluntarily adhere to a cooperation agreement, reserving the right to abandon the agreement at any time. Bittencourt (2011) considers that political conditions – such as changes in the municipality's political leadership – justify a possible exit from this type of agreement. Another feature refers to the design of the partnership needed for the implementation and execution of specific public policies, which must be adequate for cooperation in the form of a consortium. Finally, it is common for the units of the federation to cooperate in specific areas such as health care, sanitation, and housing.

Consortia can include several units of the federation, from different levels (Dalmo, 2018). If a consortium includes only municipalities, it is considered a horizontal agreement, which Silvestre et al. (2018, 2019a) classify as intermunicipal cooperation. However, if a consortium incorporates units from different levels (involving, for example, state and municipalities, or the Union and local governments), it is a vertical agreement or an inter-federative consortium. According to Silvestre et al. (2018, 2019a), both horizontal and vertical agreements are called public-public partnerships. For the authors, horizontal agreements seek cooperation to obtain more cost-benefit or to improve the quality of services. The vertical agreements go beyond cooperation, and the units from different levels of government perform different but also complementary tasks, which require coordination in order to deliver public services successfully. The expansion of the sanitation network is an example of public-public partnerships. In Brazil, the adoption of consortia is an alternative to traditional public

administration and the involvement of the private sector in the provision of public services. Dalmo et al. (2018) show that 96.7% of Brazilian municipalities declared to participate in a public consortium in 2015, against 88.1% in 2011.

Even with an increasing number of consortia, there are still some challenges regarding this approach. According to Abrúcio and Sano (2013), even in horizontal intermunicipal cooperation agreements (Silvestre et al., 2018), state governments are essential players for a successful partnership. Agranoff (2014) argues that municipalities depend on state and federal governments, emphasizing that states have the legal and operational competence to influence the creation of consortia among local governments. However, municipalities are independent and can engage in consortia without particular legal and political support. From a financial point of view, joint efforts involving all levels of government are recommended – considering their complementary nature – to promote the optimal provision of public services.

Osborne (2006, 2010) points out that the traditional public administration has been considered inefficient regarding the best use of taxpayers' money, a criticism that is usually followed by the arguments advocating the entry of private organizations to provide public services. Bel et al. (2018) have shown, however, that private organizations have not been more efficient than public institutions. The new public governance approach, therefore, favors cooperative arrangements among the units of the federation for the provision of quality public services through networks. This approach also observes the relationship of influence between the decision to cooperate and the elements presented by Feiock (2004, 2007): characteristics of communities, political institutions, the structure of policy networks, and transaction characteristics of goods. Finally, it is important to note that even though the issue of public cooperation is crucial in Brazil – especially after the decentralization movement started with the 1988 Constitution – there are still few studies on the motivation leading governments to act cooperatively (Abrucio, Filippim, & Dieguez, 2013).

3. EMPIRICAL STRATEGY

The study adopted a cross-sectional design (Bryman, 2016) to analyze the factors affecting Brazilian municipalities' decision-making process of whether to participate in consortia to provide solid waste services. The dependent variable included in the statistical model was the municipality participation or not in consortia, and the data was collected in a single moment, referring to 2015. The sources of the secondary data used in the research – sources of data defined by Blaikie and Priest (2019) as 'social artifacts' – are agencies that produce official statistics, including IBGE (2015); FIRJAN (2015); SICONFI (2015); TSE (2012); PNUD (2010). The last two sources offered data used as proxies due to a lack of figures for 2015. More recent data, after 2015, were not adequate for the study because they were not available or could not be crossed in a particular moment.

As for the number of units of analysis, municipalities that had insufficient information were excluded from the study. The total sample, therefore, was of 963 municipalities. From the sample, 181 adopted the model of consortia to provide solid waste services, while the rest (782) adopted alternative strategies – see Tables 1 and 2.

TABLE 1   VARIABLES DEFINITION AND DATA SOURCE

Concept	Dimension	Variable	Code	Source
Characteristics of communities	Social and demographic	Number of residents	(pop)	IBGE (2015)
		Gross Domestic product per capita (in R$)	(pibcap)	IBGE (2015)
		Human development index	(idhm10)	PNUD (2010)
		Gini coefficient	(gini10)	PNUD (2010)
		To belong to a metropolitan area, dummy variable coded as 0 if not; and 1 if yes	(metrop)	Local Legislation (2015)
	Local government fiscal stress	Total revenue per capita	(lnrectribcap)	SICONFI (2015)
		Public servants/number of residents	(servcap)	IBGE (2015)
		Fiscal quality index	(ifgf)[1]	FIRJAN (2015)
		Financial dependence (Taxes revenue/total revenue)	(depfin)	SICONFI (2015)
Transaction characteristics of goods	Service financial results	Revenues from payments for sanitation services (%).	(txsanea)	PNUD (2010)
		Revenues from payments for solid waste services (%).	(txlixo)	PNUD (2010)
Structure of Policy Networks	Political	The Mayor belongs to the Governor political base, binary variable coded as 0 if not; and 1 if yes	(basegovest)	TSE (2012)
		The Mayor belongs to the President political base, binary coded as 0 if not; and 1 if yes	(basegovfed)	TSE (2012)
	Trust/ experience with cooperation	To participate in another consortium, dummy variable coded as 0 if not; and 1 if yes	(outcons)	IBGE (2015)

Source: Elaborated by the authors.
(1) Fiscal quality Index includes five main indicators: Revenues; Expenses with Human Resources; Investments; Liquidity; and debt costs. It is classified as excellent (> 0.8); good (>0.6; <0.8); medium (>0.4; <0.6); critical (<0.4).

TABLE 2   DESCRIPTIVE STATISTICS

Variable	Mean	Std.Dev.	Min	Max	Obs
Consrsy	0.234	0.423	-	-	963
Pibcap	20.86	19.10	4.100	277.0	963
Pop	40197	240482	818	1.200e+07	963
servcap	0.0490	0.0204	0.00387	0.260	963
idhm10	0.670	0.0694	0.443	0.862	963
gini10	0.488	0.0648	0.280	0.800	963
ifgf	0.469	0.125	0.102	0.905	963
lnrectribcap	4.977	0.907	1.606	8.573	963
txsanea	5.863	3.537	0	28.79	963
txlixo	14.92	9.559	0.950	44.40	963
basegovest	0.453	0.498	-	-	963
basegovfed	0.431	0.495	-	-	963
outcons	0.352	0.478	-	-	963
metrop	0.225	0.418	-	-	963

Source: Elaborated by the authors.

Following the institutional collective action approach (Feiock, 2004, 2007), the research model adopted a binary dependent variable (consrsy), where the local government not engaged in consortia scores 0; while those engaged in consortia score 1. Independent variables include:

(a) Characteristics of communities – This concept refers to social, economic, and political factors existing in the context (Feiock, 2007). When social and economic conditions are homogenous, it is easier for local governments to engage in cooperative agreements. The concept is separated in two dimensions. The first one is based on social and demographic variables i.e., *the number of residents*, which is the most common variable used to analyze cooperation from characteristics of communities (Bel & Warner, 2016); and the *gross domestic product per capita* (Feiock, 2007). *Gross domestic product per capita* was chosen for the variable's economic impact on institutions. For example, high gross domestic product per capita implies in higher demand for products and services, which ends up affecting operating costs (Silvestre et al., 2019a). According to Grin and Abrúcio (2016), high inequality leads to engagement in cooperative actions because inequality tends

to increase the demand for public services, requiring resources that the municipalities may not have available. Therefore, the model includes the *human development index* and the Gini *coefficient* to capture social differences among communities. Social and political variations among the population can generate an imbalance in the mobilization and management of local resources, whether from the point of view of financial sustainability or the capacity of human resources (Klok et al., 2018). According to Hefetz and Warner (2011), density is a relevant variable and has a high influence on the decision to cooperate. The authors make a division between urban areas, suburbs, and rural areas, stating that the former are less willing to cooperate, as they have already reached economic scales, while suburbs and rural areas are more likely to need the economic benefit provided by cooperative arrangements (Agranoff & McGuire, 1998). This discussion led to the inclusion of a dummy variable in the study, assigning "1" for municipalities located in metropolitan areas and "0" for the others.

Bel et al. (2012) found that larger municipalities and those geographically sparse do not cooperate as often as others. According to the authors, the *fiscal stress* explains this phenomenon. Municipalities' fiscal stress – which Hefetz and Warner (2011) observe to be influenced by social and demographic characteristics – represents the second of the two dimensions of the concept 'characteristics of communities' proposed in this study. Bel et al. (2012) state that local governments are prone to cooperate in the provision of public services at risk due to the high level of fiscal stress. The model proposed here considers four variables for this dimension: *total revenue per capita*, *ratio between the number of civil servants and the number of residents* (Blaeschke & Haug, 2018), the *FIRJAN Fiscal Management Index* (IFGF), and *financial dependence* (ratio between tax revenue and total revenue (Warner & Hefetz, 2011).

(b) Transaction characteristics of goods – This is a concept related to the financial result of the service provided, measured by the *revenues from the payments for sanitation and solid waste services*. These variables are justified because when the costs of services are high, cooperation becomes one of the solutions to overcome financial restrictions (Bel et al., 2012);

(c) The structure of policy networks – This concept is separated here into two dimensions. The first is t*rust*, which is a crucial element in the relationship among partners in cooperation arrangements. Trust relationships reduce transaction costs; in the model, they are characterized by the dummy variable of *participation or not in other consortia* (other than those related to solid waste services), being assigned "1" when the municipality participates and "0" if otherwise. Cooperation agreements are facilitated when the actors already have some previous experience of participating in this type of arrangement (Chen & Lee, 2017; Di Porto & Paty, 2018; Klok et al., 2018). The second dimension is *political*, which is present in the relationships among participants of cooperative agreements and plays a critical role in building trust (Voorn et al., 2019). This political aspect of relationships depends on political-electoral cycles, which leads to the expectation that municipal governments that have an ideological alignment will cooperate more frequently (Stoker, 2006). Bel et al. (2012) state that cooperation depends on the affinity

of the political parties and, for this reason, the model adopts the binary variable that assigns "1" if the mayor belongs to a base party policy of the governor or the president, and "0" if they belong to another party.

As mentioned above, legislation is another crucial element for the success of a cooperative agreement (Feiock, 2007) since the law shapes the way partnerships are designed and established, benefiting or jeopardizing collective efforts (Klok et al., 2018). In Brazil, the political institutions in all levels of government are structured in the same way and follow the same norms. Therefore, they hardly influence the decision-making of whether to engage in consortia. Therefore, this variable was not included in the model. Also, the political relationships and the complexity of the policy networks in which the municipalities are involved were out of this research's scope, considering the difficulty to obtain specific data and the fact that the research design captures a specific moment in time.

The study applied correlation analysis before proceeding with the logistic regression model. The analysis sought to understand the relationship between the variables, or how each reacts in the presence of the other (when $p > 0.05$), which was the first step to test for collinearity. If two or more variables in the model have a linear relationship, they are unlikely to explain alone the change in a dependent variable. Therefore, the variables not correlated with others were listed, safeguarding the statistical significance of the study. After this first analysis, variables with significance close to 1 were excluded from the logistic regression model, which needs to meet the following premises for reliability:

(i) The dependent variable will always be dichotomous or binary (if the event does not occur, coded as 0; or if it occurs, coded as 1);

(ii) The dependent variable follows a Bernouli's distribution. Thus, y is a binary variable that equals {0,1}, with a probability distribution function given by:

$$P (y / p)= p^y (1 - p)^{1 - y}$$

Where,

y refers to the events regardless of whether they occurred;

p describes the probability of the occurrence of the event.

In addition, the odds ratio provides a measure of the influence of a given factor on the event. This prediction is essential in the statistical analysis, as it measures the dimension of the influence of each independent variable included in the model (Mesquita, 2014). A positive and higher coefficient means that the variable has greater power to predict the occurrence of the event. Finally, the maximum likelihood estimate was applied in order to guarantee internal validity. The data were processed using Stata/MP® 14.0 statistics package.

4. DISCUSSION OF RESULTS

4.1. Overview

The *Política Nacional de Resíduos Sólidos* (PNRS) (national solid waste policy) defines solid waste management as the set of actions carried out, directly or indirectly, involving collection, transportation, discharge, treatment, and the environmentally appropriate disposal of solid waste. All steps need to be aligned with a mandatory municipal plan for solid waste management (Zappe, 2016). The PNRS was implemented by Law 12305 of 2010, after twenty years of discussion, and the main changes brought about by the plan are due to the involvement of all actors, including private organizations, who need to share responsibilities regarding the collection and treatment of solid waste. The new law also defined 2014 as the deadline for replacing traditional landfills with sanitary landfills, which need to be licensed by environmental agencies. In addition, complementary policies such as environmental education for communities need to be carried out, and, at the operational level, reverse logistics and composting systems should be implemented (Ferreira, Procidonio, & Prestes, 2017).

The PNRS was designed to impact solid waste services financially and technically. The measures provided in the policy are even more challenging for smaller municipalities since they usually lack financial capacity and expertise. Therefore, the PNRS encourages intermunicipal cooperation or the creation of consortia at a regional level, so that sharing services reduces cost and facilitates the implementation of the new policy (Bernardes et al., 2017).

4.2. Discussion

Table 3 shows the correlations between the dependent variable and the independent variables of the concepts 'characteristics of communities,' 'transaction characteristics of goods,' and 'the structure of policy networks.' First, the financial results of services provided have a positive relationship with the revenues from payments for sanitation (r = 0.0532*) and for solid waste services (r = 0.1022 *), both variables of the concept transaction characteristics of goods. When analyzing the structure of policy networks, the political dimension is not correlated with the dependent variable, but trust (r = 0.4979 *) shows a positive correlation. For the characteristics of communities, it is interesting to note that there is no correlation between (non) cooperation for the provision of solid waste services and the number of residents (r = -0.0246*). For social and demographic characteristics, there is a negative correlation between the dependent variable and the gross domestic product per capita (-0.0492*), the human development index (-0.0969*), and the location of the municipality in a metropolitan area (-0.0583*). The same holds for the municipality's fiscal stress, with a negative correlation between the dependent variable and total revenue per capita (r = -0.0811*), and with the IFGF (r = -0.0784*). It is possible to verify stronger relationships between some of the model's variables with the dependent variable, such as the revenues from payment for solid waste services, which has a stronger relationship than that observed in the case of the revenues from payments for sanitation services. These relationships can be stronger and more positive, as observed in the dimension of trust, or negative, as occurred with the human development index.

TABLE 3   CORRELATION MATRIX

	consrsy	Pibcap	pop	servcap	idhm10	gini10	ifgf	lnrectribcap	txsanea	txlixo	basegovest	basegovfed	outcons	metrop
consrsy	1													
pibcap	-0.0492*	1												
pop	-0,0246	0.0850*	1											
servcap	0,0251	0,0229	-0.1684*	1										
idhm10	-0,0969*	0.4972*	0.1403*	-0.2015*	1									
gini10	-0,0001	-0.1522*	0.1148*	-0.0970*	-0.3796*	1								
ifgf	-0.0784*	0.2520*	0.0918*	-0.1337*	0.3788*	-0.1214*	1							
lnrectribcap	-0.0811*	0.6064*	0.1740*	-0.1321*	0.7435*	-0.1859*	0.4015*	1						
txsanea	0.0532*	-0.1457*	0.0703*	-0.0290*	-0.3247*	0.3146*	-0.2564*	-0.1622*	1					
txlixo	0.1022*	-0.4838*	-0.1037*	0.2024*	-0.8893*	0.3804*	-0.3975*	-0.7151*	0.3483*	1				
basegovest	-0,0138	-0,0006	-0,0112	0.0319*	-0,0083	-0,0097	-0,0066	0,0146	0,0212	0,0092	1			
basegovfed	-0,0157	-0,0132	0,0026	0,008	-0,0456*	0,0232	0,0258*	-0,0471*	-0,0202	0,0393*	0.0671*	1		
outcons	0.4979*	0.0525*	-0,0149	-0.0528*	0.0962*	-0.0586*	0.0746*	0.0715*	-0.0922*	-0.1259*	-0.0276*	-0,0013	1	
metrop	-0.0583*	0.1391*	0.1352*	-0.1037*	0.2151*	-0.1030*	0.1354*	0.2110*	-0.0368*	-0.1579*	-0.0311*	-0,0114	0,0169	1

Source: Elaborated by the authors.

*sig. $p < .05$

The next step was the application of logistic regression. Table 4 shows relevant variables to explain the involvement of municipalities in consortia to provide solid waste services. Given the social and demographic characteristics of communities, the human development index was significant in the first regression model. The research tested the hypothesis put forward by Grin and Abrúcio (2016), who expected that higher inequality among residents would lead to a greater likelihood of the local government to engage in intermunicipal consortia. Differently from Grin and Abrúcio (2016), the present study found a relationship between inequality and cooperation among municipalities, showing that low inequality among residents would lead to a higher probability of the local government to participate in intermunicipal consortia.

TABLE 4   LOGISTIC REGRESSION (ODDS RATIO)

	(1)	(2)	(3)	(4)	(5)
Variables	**consrsy**	**consrsy**	**consrsy**	**consrsy**	**consrsy**
pop	-6.99e-08				-7.80e-08
	(2.71e-07)				(4.37e-07)
pibcap	0.00493				0.00858*
	(0.00362)				(0.00481)
idhm10	-4.078***				-0.305
	(1.413)				(3.812)
gini10	-2.102				-3.452*
	(1.453)				(1.878)
lnrectribcap		-0.335**			-0.571**
		(0.148)			(0.267)
servcap		-3.395			-4.833
		(5.320)			(6.572)
ifgf		-1.992***			-2.269**
		(0.720)			(0.886)
depfin		-0.0150			-0.0331**
		(0.0122)			(0.0160)
txsanea			-0.00976		0.0504
			(0.0241)		(0.0326)
txlixo			0.0199**		0.0560**
			(0.00827)		(0.0267)
basegovest				-0.242	-0.331*
				(0.185)	(0.196)

Continue

Variables	(1) consrsy	(2) consrsy	(3) consrsy	(4) consrsy	(5) consrsy
basegovfed				-0.0717	0.00112
				(0.181)	(0.191)
outcons				1.981***	2.791***
				(0.188)	(0.257)
Constant	2.241*	2.658*	-1.661***	-2.351***	4.884
	(1.341)	(1.612)	(0.171)	(0.187)	(3.913)
Pseudo R²	0.01	0.02	0.00	0.14	0.22
Hosmer-Lemeshow	5.07	9.67	23.13	1.03	6.18
Prob-chi2	0.74	0.28	0.003	0.90	0.63
Observations	963	963	963	963	963

Source: Elaborated by the authors.
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Contrary to expectations, there was no relationship between participation in intermunicipal consortia to provide solid waste services and the size of the population. Also, the fact that the municipality is in a metropolitan area does not significantly influence the local government involvement in cooperative arrangements. According to Klok et al. (2018), smaller governments are more likely to cooperate, as it may be the only way to balance service provision and financial restrictions. On the other hand, larger municipalities have financial and human resources and, therefore, they are not so frequently involved in cooperation – which was confirmed in this study. As found by Bel et al. (2012), the research showed that municipalities in metropolitan regions do not cooperate as often as the others, and fiscal stress explains this result.

For the dimension of the municipality's fiscal stress, the variables IFGF and total revenue per capita were identified as predictors of municipal involvement in cooperative arrangements. Local governments with the most favorable IFGF and the highest total revenue per capita seem to prefer the provision of services through consortia more often. Silvestre et al. (2019a, 2019b) assume the service coverage as the main predictor of involvement in consortia. The authors detail that, even if one of the primary reasons behind the cooperation is cost reduction, Brazilian municipalities may also aim to increase the coverage of services. Therefore, when IFGF is favorable, local governments can seek consortia to expand coverage or improve the quality of services, a statement that is based on total revenue per capita that affects the decision of the municipality to participate in a cooperation agreement. In this sense, the local governments with the highest tax revenue per capita are those who have the financial availability to sign cooperation agreements for consortia to offer solid waste services. Law 12305 of 2010 provides for this as it is legislation that presents a new paradigm for policy implementation, represented by the introduction of plans for solid waste treatment (Bernardes et al., 2017).

In the case of the transaction characteristics of goods and observing the municipality's fiscal stress, it was expected that the financial results of solid waste services would present a statistical relationship with the cooperation agreements in the form of consortia. This hypothesis was not rejected by the Hosmer-Lemeshow test and by the results of Prob-chi². The adjusted model is not better than the initial model, which is why the statistical results fail in terms of internal validity.

When analyzing the structure of policy networks, the variable related to previous experience with cooperation is statistically significant for municipalities to be involved in consortia to provide solid waste services. Feiock (2007) points out that local governments who are partners in these initiatives or who have already been involved in other cooperation agreements tend to participate again. In the specific case of solid waste services in Brazil, the local governments involved in other cooperation agreements are most likely to participate. Overall, the likelihood of a municipality entering a cooperative agreement is 16 times greater when the local government has already been involved in other such agreements, confirming the claims by Chen and Lee (2017), Di Porto and Paty (2018), and Klok et al. (2018). As for the political dimension, belonging to the governor's political group does not appear to be a significant variable for engaging in cooperation.

In the last regression, the characteristics of communities (including fiscal stress and social and demographic variables of the municipalities), the transaction characteristics of goods, and the structure of policy networks were included in the model. The statistical results show that the gross domestic product per capita is related to cooperation. According to Silvestre et al. (2019a), the higher the purchasing power of the population, the more significant the increase in service costs due to the increase in consumption levels. Finally, cooperation may be a solution to cope with increasing operating costs due to the associated economies of scale.

In this regression, the human development index did not show statistical significance, different from the Gini coefficient. The results showed that a decreasing Gini coefficient leads to higher levels of cooperation. According to Feiock (2007), it makes no sense to cooperate with other local governments that are not working to solve the same problem, i.e., looking for partners makes sense when the problems of participants are similar in nature and degree. Public cooperation is, above all, a matter of reducing service costs. When analyzing fiscal stress, the decrease in total revenue per capita and IFGF showed to lead to a higher likelihood of engaging in consortia to provide solid waste services. This finding is in agreement with Bel et al. (2012), for whom the municipalities tend to cooperate to overcome problems in the provision of services in times of high fiscal stress. However, when the financial dependence of the municipalities is low, cooperation also increases. The research showed that the PNRS was responsible for a series of financial and technical challenges (Bernardes et al., 2017) that can be overcome more easily through cooperative arrangements.

The analysis of the results of the structure of policy networks' regression identified that when the mayor is not part of the governor's political group, they are more likely to engage in cooperation. Stoker (2006) advocates for the political nature of cooperation, and Voorn et al. (2019) argue in the same direction, showing that ideological alignment facilitates cooperation. The results for these aspects were diverse. However, the findings reinforce Agranoff's (2014) argument that municipal governments are independent in their decisions and can engage in cooperation, regardless of political affinity or legal

support. The study noted that decreasing total revenue per capita and IFGF led to the increasing use of consortia for the provision of solid waste services, indicating that the adoption of this practice is a matter of cost and not a political issue.

Also, the involvement in previous cooperative agreements shows a strong influence in the decision-making of whether to engage in intermunicipal consortia to provide solid waste services. This result corroborates the studies by Chen and Lee (2017), Di Porto and Paty (2018), and Klok et al. (2018), who claim that previous experiences facilitate other cooperation agreements. For Feiock (2007), trust leads to cost reduction due to the increase in social capital.

4. CONCLUSION

This study adopted a cross-sectional approach to analyze the factors that influence Brazilian local governments in the decision-making process of whether to participate in intermunicipal consortia to provide solid waste services. The discussion adopted the perspective of Institutional Collective Action, working with independent variables for the concepts of characteristics of communities, transaction characteristics of goods, and the structure of policy networks, observing their influence on the tendency of municipalities to act in cooperation. Two main conclusions can be drawn from the results of this study. Firstly, the Brazilian *Política Nacional de Resíduos Sólidos* (PNRS) (national solid waste policy), brought significant financial and technical challenges to local governments, who found in cooperative agreements an opportunity to reduce costs and effectively meet PNRS demands. The effectiveness of this strategy is evident since it has also been used by municipalities that are in more favorable fiscal conditions. Second – and unlike international literature, –, intermunicipal consortium in Brazil is not a political tool, and it does meet the need to achieve the objectives set for public policies. It can be argued that the national political, economic, and social dynamics greatly influence the research outcomes, which are different from the findings of previous studies examining Western developed countries. Despite the differences, however, the perspective of the Institutional Collective Action was crucial to analyze and understand the findings.

The research represents the first step towards a more in-depth discussion on the motivations of local governments to engage in intermunicipal consortia. In this sense, Bel and Warner (2015) are categorical in stating that more data is needed for an in-depth analysis of cooperation in the public sector. The study applied a cross-sectional approach, which is insufficient to capture the evolution of this specific phenomenon over time. Therefore, other studies considering a more extended period are needed in order to overcome the limits of the research. In addition, Abrúcio and Sano (2013) draw attention to the importance of the state government, pointing out that the administration at this level of government can play a crucial role in promoting the involvement of municipalities in consortia. At this point, one can question the effect of the financial support from the federal and state government to municipalities, building a situation where local governments do not feel the need to cooperate with others in their region, refusing to tackle the challenge of overcoming technical and financial problems (Agranoff, 2014). Moreover, cost reduction may not be the first motivation to cooperate. According to Allers and Greef (2018), cooperation may primarily seek to improve the quality of services and not the reduction of costs, something that was not captured in the main conclusion of the study. Finally, the analysis needs to be expanded to other services. When confronted with other

types of services, the robustness of the research conclusion will also be stronger, since it is possible to carry out a comparative analysis.

Therefore, further studies are needed to highlight the motivations for the involvement of municipalities in public consortia in Brazil. This study is expected to contribute to the understanding of intermunicipal cooperation in the country, which is not a new topic. However, it is undoubtedly one of the most growing topics regarding the discussion of public service provision (Evans & Sapeha, 2015).

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